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A systematic review of interventions to improve involvement in physical activity among adults with intellectual disability

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Abstract

Background: Evidence suggests that most adults with intellectual disability do not participate in sufficient amounts of physical activity (PA). A systematic review of peer-reviewed studies that reported an intervention aiming to improve PA levels of adults with intellectual disability was conducted. **Methods**: Keywords related to intellectual disability and physical activity were used to search relevant databases. Studies were excluded if they did not measure PA as an outcome for adults with intellectual disability, were non-English, and were not peer-reviewed. All relevant studies were included in the review regardless of methodological quality and design. **Results**: Six articles met the inclusion criteria. These included health education or health promotion programs with PA, nutrition and weight loss components. The quality of studies included in this review was generally poor. Most studies used a pre-post design, sample sizes were small, and measurement tools were used that are not valid and reliable for the population assessed. **Conclusions**: PA interventions have the potential to improve the health and wellbeing of people with intellectual disability, a vulnerable group who require attention from public health practitioners and researchers. Given the health inequities that exist, public health researchers should target efforts to improve PA levels among this group.

Keywords: disability, exercise, health promotion

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Physical activity (PA) guidelines recommend that adults aged 18-64 years participate in 30 minutes of moderate intensity PA on most, if not all, days of the week.[1] The benefits of PA, including chronic disease prevention and management and mental health benefits,[2] are particularly important for people with intellectual disability. People with intellectual disability experience poorer physical and mental health and higher risk and rates of chronic disease than the general population, but receive less health promotion.[3-5] For example, compared with members of the general population people with intellectual disability have a higher prevalence of hypertension (25-41% compared to 29% of the general population);[6] obesity (30.8-36.6% compared to 18.2-18.5%);[7] and metabolic syndrome (21.0-29.3% compared to 13.5-17.9%).[8] Intellectual disability is characterised by low general intellectual functioning (measured by an IQ score of below 70) along with limitations in two or more adaptive skill areas: communication, self-care, social skills, self-direction, home living, health and safety, functional academics, leisure, work and community use.[9] Despite representing a substantial proportion (approximately 2%) of the population, many people with intellectual disability receive poor healthcare and their needs often remain unmet by healthcare practitioners.[3] This may be due to poor communication and recall of health data by the person themselves or the systems that support them, and be exacerbated by a vulnerability to syndrome associated conditions and negative attitudes of health professionals and community members towards these individuals.[3]

People with intellectual disability may process information slowly, have difficulty with abstract ideas, and have varying ranges of communication and literacy levels.[9] Research involving this group can be resource intensive and needs to be tailored to meet their needs; however, these difficulties should not preclude the inclusion of this group from rigorous research studies. For example, allowing additional time for the consent process and providing information sheets and consent forms in an easy to read format is likely to benefit all research

participants. Data collection tools also need to be flexible; people with intellectual disability may require assistance to complete paper and pen surveys or have a family member or carer complete it on their behalf. Although the use of proxies is not ideal because the responses of the carers or family members may not be a true representation of an individual's views, researchers may find it necessary to seek proxy responses when they are otherwise unable to communicate with the participant.[10,11]

Given their unique health needs, and health disparities, it is critical that health promotion interventions are designed to be acceptable and appropriate to participants with intellectual disability. Such interventions need to be well-planned and carefully executed, due to challenges associated with identification or ascertainment of disability and consequently recruitment of this population, gate-keeping practices of support organisations, the process of obtaining informed consent and other ethical limitations.[12] In relation to ascertainment and recruitment, it is particularly difficult to recruit participants who are part of the 'hidden majority' of those with intellectual disability; that is, those individuals who are not connected with disability service providers, who are marginalised through homelessness or chaotic, unstable living arrangements, or who do not identify as a person with a disability.[13] In previous health promotion research, Marks and Heller[14] recommend several health promotion strategies for people with intellectual disability including establishing community based policies, environments supportive of health and developing personal and social skills. In developing interventions that are more inclusive and acceptable for people with intellectual disability, health promotion efforts are likely to benefit other marginalised and often overlooked groups, including those with poor literacy (e.g., through easy-to-understand communication), the elderly (e.g., through programs that take into account poor mobility), and those with other disabilities (e.g., due to physical impairments).

In their systematic review of prevalence of PA among people with intellectual disability, Temple et al.[15] conclude that insufficient evidence exists to support the often suggested notion that this group engages in lower levels of PA than the general population. However, the authors suggest the majority of people with intellectual disability do not participate in sufficient amounts of PA to meet their national guidelines.[15] Indeed, a review of international research found that only 8-16% of adults with intellectual disability met PA guidelines compared with 30-47% of people in the general population.[7]

To date, PA research involving people with intellectual disability has been relatively narrow in its approach. First, research has largely been focused on improving physical fitness levels. Second, research has generally been centre-based or used equipment that may not be widely available to many people (e.g., treadmills and rowing machines). Finally, physical fitness programs that have been offered to people with intellectual disability have not demonstrated long-term sustainability or community connections. Previous studies have also failed to provide information on frequency, intensity, duration or type of the PA performed.[15]

Accordingly, we know little about how to design appropriate and acceptable interventions for people with intellectual disability, and consequently, how to improve their health and wellbeing through health promotion. This represents an important knowledge gap, particularly in relation to interventions whereby PA might be easily incorporated into the lives of people with intellectual disability. By identifying effective physical activity interventions for people with intellectual disability we can better direct future efforts. The aim of this review was to identify the strengths and weaknesses of PA interventions for people with intellectual disability that aim to measure changes in PA levels, rather than those that aim to increase physical fitness outcomes.

Methods

Search strategy

Searches were conducted in CAB abstracts (from 1910), CINAHL (from 1982), the Cochrane Library (from 1996), ERIC (from 1966), Health Source: Nursing/Academic Edition (from 1975), Medline (from 1950), PsycINFO (from 1840), Scopus (from 1966), SPORTDiscus (from 1800) and Web of Science (from 1898) until 22 August 2012. The following search terms were used: developmental disability OR Down syndrome OR intellectual disability OR learning disability OR learning difficulties OR learning disorders OR mental retardation OR intellectual handicap OR intellectual impairment OR mental handicap AND exercise OR physical activity OR sports OR walking AND program OR intervention. Reference lists were manually searched for eligible articles. A cited reference search was then conducted for more recent interventions, relevant reviews and key articles using Web of Science.

Eligibility criteria

Eligible articles were peer-reviewed studies that reported an intervention targeted to adults with intellectual disability and aimed to change PA levels. Studies were excluded if they did not measure PA as an outcome, were non-English, or were not peer-reviewed. All relevant studies were included in the review regardless of methodological quality and design.

All identified articles were assessed for their relevance to the selection criteria by reading titles and abstracts. If abstracts were unavailable or did not provide enough detail to assess study relevance, the full text of the article was obtained and reviewed. Full text reports were independently reviewed by two team members (KB and KvD). All eligible studies passing this stage of the screening were included in the review.

Data extraction and analysis

Data from eligible articles were extracted independently by two reviewers (KB and KvD) using a predefined data extraction tool that identified the lead author, year of publication, country of origin, study design and duration, setting, sampling strategy, sample size and demographics, identification method of people with intellectual disability, level of intellectual disability, other disabilities or mobility limitations, PA intervention, and PA measure and outcomes. The reviewers were not masked to study authorship and differences were resolved by discussion.

No statistical analysis or meta-analysis was conducted due to heterogeneity among identified studies in terms of study interventions and outcomes. Thus, the existing analyses reported in the reviewed articles were reported in a narrative format. In accordance with reporting guidelines for systematic reviews, a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)[16] checklist was used to guide the reporting of this review.

Assessment of article quality

To characterise study quality, we adapted a ranking system developed by Whitt-Glover and Kumanyika[17] who originally developed the system to assess study quality in their review of PA interventions targeting African-Americans. Assessment is across five components on a three-point scale, where three is the highest rating. Components include study design (uncontrolled trials/nonrandomized trials/randomised controlled trials); degree of focus on PA (not primary focus/part of primary focus/sole primary focus); inclusion of PA goals in the intervention (none/implied/explicit); PA measurements (subjective only/secondary measures objective/primary measures objective); and disability adaption

(none/recruitment of people with intellectual disability/intervention adapted for people with intellectual disability).

Results

The literature search identified 1,562 articles, of which 691 were duplicates. Of the remaining 871 articles, exclusions were made based upon selection criteria at the title and abstract level; 52 were reviewed at the full text level. After reviewing title and abstracts and when necessary the full text, six articles met the inclusion criteria (Figure 1).

Study characteristics

Five studies were conducted in the United States of America,[18-22] and one was conducted in the United Kingdom.[23] The combined number of participants with intellectual disability in the included studies was 856, with sample sizes ranging from 42 to 432 participants. Five studies were published as "pilot" studies. Five of the six studies reported a pre- post-design with measures taken at baseline and completion of the program.[18-20,22,23] Only one study, McDermott et al.,[21] conducted a randomised control trial. One program, Health Education Learning Program (HELP)/Steps To Your Health (STYH), was evaluated in three different studies.[19-21] First, Ewing et al.[19] investigated if the HELP program (simplified for participants with intellectual disability) could be used for participants with intellectual disability and participants without intellectual disability. Mann et al.[20] then modified the program, to develop STYH to meet the needs of participants with intellectual disability. McDermott et al.[21] then conducted an RCT to further assess the efficacy of the program for participants with intellectual disability.

Participants

All participants were adults with intellectual disability residing in the community. Level of intellectual disability ranged from mild to severe, although four studies only

included adults with mild to moderate intellectual disability.[18,19,21,22] Level of intellectual disability was established in Ewing et al.[19] through medical records and in Melville et al.[23] through the use of a set of questions assessing ability and need for support. The remaining studies did not report how they established level of intellectual disability. Age of participants ranged from 18-71 years with mean age ranging from 38-48 years. Consistent with previous general population health promotion research,[24] all studies recruited a slightly higher percentage of females with most studies reporting approximately 40% male and 60% females. Bazzano et al.[18] and Melville et al.[23] included only people who were overweight or obese. Most interventions required participants to be ambulatory and Mann et al.[20] and McDermott et al.[21] required participants to be able to communicate verbally. Participants were primarily recruited through disability service organisations[20-22] and health care settings.[18,19,23] Other recruitment strategies included community presentations, distribution of flyers and mail out of invitations followed by phone calls.[18]

Interventions

Setting and delivery modality

Almost all of the interventions were set in the community with the sessions being implemented through support organisations and in a group format.[18-22] Ewing et al.[19] and Mann et al.[20] also offered optional home visits to participants to develop a home exercise program (including exploring suitable walking routes in their community) and grocery visits to help identify healthy food choices. Melville et al.[23] conducted the only individualised intervention set within participants' homes.

Duration and contact intensity

The interventions ranged in frequency from once every two to three weeks to twice weekly. The length of each session ranged from 30 to 120 minutes. Four of the interventions

were conducted over eight weeks; Melville et al.[23] and Bazzano et al.[18] conducted longer interventions of six to seven months (see Table 1).

Intervention components

All interventions except Ewing et al.[19] were aimed only at people with intellectual disability. Ewing et al.[19] conducted their study with participants without intellectual disability and compared the results to participants with intellectual disability. None of the interventions reviewed involved making changes to the individuals' local environment. Ewing et al.[19] was the only study to report on intervention fidelity. The health educators implementing and teaching the program were observed to ensure they followed the curriculum. They were also provided with regular supervision that stressed the importance of presenting the information consistently. All studies were health education or health promotion programs with PA, nutrition and weight loss components. The interventions were taught and implemented by experienced health professionals,[18,23] the research team,[22] health educators[19,21] and staff at the service organisation in which the intervention was being implemented. The staff implementing the intervention were given training and support from the research team. Bazzano et al.[18] also recruited and trained peer mentors to help deliver their intervention. The peer mentors demonstrated what was being taught in the lesson (e.g. safe cooking techniques in a nutrition lesson). The peer mentors also created an exercise video for participants and were available to participants for support.

The primary focus of the interventions was education about PA and the other health behaviours of interest. Three interventions[18,20,22] used interactive lessons to convey their information. Four of the studies[19,20,22,23] provided information on the benefits of exercise and information about PA guidelines.

Melville et al.[23] took an alternative approach and had individual discussions with participants about their current PA behaviour and strategies they could apply to increase their PA (for example, replacing sedentary behaviours at home with gardening). They also provided participants and their support person with details of local clubs and facilities with accessible groups. Melville et al.[23] helped participants to set goals to increase their PA and provided participants with pedometers so they could self-monitor their own activity.

Participation in PA was also a common component of the interventions. Ewing et al.[19] and Mann et al.[20] offered optional brisk walks after the sessions and Bazzano et al.[18] incorporated one hour of exercise in the sessions and visited local parks and fitness facilities as a part of the one hour exercise component of their intervention. Bodde et al.[22] and McDermott et al.[21] demonstrated and practiced exercises and stretches in the sessions.

Staff were involved in the intervention implementation by Mann et al.[20] and Bazzano et al.[18] encouraged support staff and family members of participants to attend their lessons. Melville et al.[23] was the only study to formally involve carers to support participants in the intervention.

Behaviour change theories

Only two of the studies elucidated to the theoretical model used to guide the development and implementation of the interventions. Bazzano et al.[18] developed a conceptual model based on Social Cognitive Theory. The model and theory focused on self-efficacy, positive reinforcement and peer mentoring. Bodde et al.[22] based the lessons in their intervention on the Theory of Planned Behaviour.[25]

Physical activity outcomes

PA was measured using objective and subjective measures. Half the studies used accelerometers to measure minutes per day spent in PA and sedentary time. Melville et al.[23]

collected data over seven days and data was available for over 70% of participants. Data was supplemented by the International Physical Activity Questionnaire short form questionnaire (IPAQ-S). This was completed by carers and participants together. Bodde et al.[22] also used data from seven days but full data was only available for 59% of the participants. McDermott et al.[21] collected data over five days including two weekend days. Baseline and follow up data was only available for 26% of participants. Although compliance rates were low, difficulties that arose for participants when using the accelerometers were not discussed. Subjective measures were used by the remaining studies. The Behavioural Risk Factor Surveillance System questionnaire was used by two studies.[19,20] Ewing et al.[19] reported binary findings in terms of participants being active or inactive and when necessary (i.e. when the participant couldn't respond) used a proxy respondent. Mann et al.,[20] focused on the frequency of PA due to concerns about the poor validity of respondents' answers (associated with people with intellectual disability possibly having difficulty with time). Bazzano et al.[18] measured PA frequency and duration in interviews with participants. Interviews were conducted by physical and occupational therapists and relied on the participants to recall their PA during the previous week.

Three studies reported a significant improvement in PA (Table 2).[18,20,23] Bazzano et al.[18] and Mann et al.[20] reported a significant increase in the mean frequency of self-reported PA per week. Melville et al.[23] found significant increases in percentage of time spent in light intensity PA and significant decreases in time spent in sedentary behaviour. However, the IPAQ-S suggested no change between baseline and follow up measures. Ewing et al.[19] and Bodde et al.[22] reported no significant increases in PA for the people with intellectual disability in their study; however, Ewing et al.[19] found that PA in the participants without intellectual disability significantly increased. McDermott et al.[21] found no significant difference in mean time spent in moderate to vigorous intensity PA between the intervention

and control groups at 12 months. Bodde et al.[22] was the only study to report a small effect size.

Assessment of articles

Quality ratings are reported in Table 3. All studies except McDermott et al.[21] rated 1 on study design due to uncontrolled study design. All studies reported PA as a part of the primary focus (rating of 2) and Melville et al.[23] was the only study to report the setting of PA goals (rating of 3). Three studies rated 3 on PA measurement by their use of objective measures (e.g. accelerometers). All studies rated well on disability adaption but Ewing et al.[19] (rating of 2) as they did not completely adapt their program to meet the needs of people with intellectual disability.

Discussion

The evidence base for how to improve participation in PA among people with intellectual disability is under-developed, contrasting with the substantial evidence base that exists for the general population, as well as the extensive health promotion efforts aiming to improve PA in the general community.[15,26,27] Given the health inequities experienced by people with intellectual disability,[4] a public health impetus to target efforts to this group should exist. Efforts should be focused on not only intellectual disability specific interventions but also on the inclusion of people with intellectual disability into mainstream interventions.

Our findings suggest that interventions have had some success in using goal setting strategies, health education focusing on the benefits of PA in a group and individualised format, incorporating PA into the intervention and using group and individual delivery modalities. However, these results are based upon a small number of studies mostly of a pre-post-design with small sample sizes. None of the measures used in the studies reviewed have

been demonstrated to be valid or reliable in people with intellectual disability and, importantly, findings lacked follow-up data to determine the impact of interventions in the long term.

Future research directions

Objective measures (e.g., pedometers and accelerometers) were used in half of the articles reviewed. Unfortunately, none of the included studies noted any difficulties associated with the use of accelerometers even though all studies reported low availability of full data for participants. It would be useful for authors to document the barriers associated with accelerometer and pedometer use so that future research can attempt to address challenges associated with using these tools, rather than 'reinventing the wheel' each time.

Although the use of objective measures is ideal to avoid biases associated with self-report, reported results using these measures may not represent the true effects of the interventions. Given the infancy of the field and the poor understanding of how to capture objective/subjective measures of PA improvement among members of this population group, it is difficult to say, with certainty, that studies have captured the true effects of the interventions. For example, in Bodde et al.[22] the number of participant's wearing the accelerometer as directed by the research team was low; only 59% of participants met the minimum requirement of three days of eight or more hours. Accelerometer use may be problematic because participants may require assistance to put on and remove the device and may need prompting to wear the accelerometer.[28] Subjective measures that were used (for example, the IPAQ-S) were also problematic; the IPAQ-S has been found to be valid and reliable in numerous populations but has only been found to have limited agreement between objective measures of PA.[29] Difficulties arise with recall, abstract concepts of intensity and duration of PA, and if completed by proxies, the ability of carers to accurately complete the

survey.[28,29] Relying on proxy respondents is not ideal as it may not be a true representation of the participant's views. Alternative methods to surveys to measure PA may be using qualitative methods (i.e. in-depth interviewing or participant observation) or alternative data collection tools (i.e. picture surveys).[30]

Future research efforts are needed to determine the appropriateness of "mainstream" measurement tools among people with intellectual disability. Also needed is research about the reliability of proxy respondents (e.g., asking carers to report levels of physical activity). Tailored tools that allow us to accurately capture PA levels among this group in a way that is acceptable and appropriate to their lives will help to build an evidence base around current activity and the impact of interventions. Previous work has also called for establishing valid and reliable measures,[15] due to the paucity of measurement tools found to provide valid and reliable data relating to PA levels in people with intellectual disability. Given the diversity of abilities among this group, including range of movement and mobility, a range of tools is likely to be needed.

To provide new insights into this field we recommend evidence should be collected and analysed in a manner consistent with the World Health Organization's International Classification of Functioning, Disability and Health (ICF). The ICF is a conceptual framework used in health and disability related research and provides a means to conceptualise, classify and measure disability in a consistent and transparent way.[31] Interventions should be guided by the theoretical principles asserted by the ICF and should clearly articulate assumptions about where and how interventions are directed. For example, the ICF requires statements about whether interventions are targeted to individual behaviours (e.g., reducing the amount of time spent sitting) or structural factors (e.g., safer environments in which to exercise). Importantly, the ICF requires separation of impairment from disability, in recognition that structural barriers may dis-able those with cognitive or physical

impairments. This is an empowering approach that places onus of responsibility on researchers and other health professionals to amend and adjust physical activity interventions to suit the lives of those with intellectual disability, rather than requiring individuals to fit into programs that might not be tailored to them.

Methodological limitations of the included studies

A limitation of all the studies included in this review was the lack of adequate description of the populations. Most studies reported recruitment via a support organisation; however, the strategies used within this organisation to recruit participants were not reported. The studies also failed to provide information on the total number of individuals in the target population group, including how many were approached and how many consented to be a part of their study. Most studies did not report how they identified people with intellectual disability, how they established their level of disability or the representativeness to the wider intellectual disability population. Within the field of intellectual disability research this is an aspect of reporting that we can improve on[15] to determine the representativeness of participants and so we can better understand "what works" across different levels of disability.

The quality of studies included in this review was generally poor. Five studies used a pre-post design, sample sizes were small, and, as already highlighted, measurement tools were used that may not be valid and reliable for the population assessed. Further, follow-up was limited to a short period following the intervention for all but one study, so long-term effects are unknown.

Only one randomised controlled trial was identified. Rigorous evidence is required to better understand how to improve the health of people with intellectual disability, and to compare research findings for the general population. Researchers should strive to apply the

same methodological rigour applied to research with other population groups. Although involving people with intellectual disability in research where health measurements and assessments need to be taken may be challenging[3,32] and interventions can be resource intensive, developing strategies that are appropriate for this group is likely to benefit other marginalised and overlooked groups, including those with mental illness, groups with low literacy, and those from culturally diverse backgrounds. To address health inequities, effort is needed to better understand how we, as researchers, can better investigate the health-related experiences of those groups who are difficult to target and involve in interventions.

Limitations of this study

Our findings should be interpreted in the context of the study's limitations. This review used rigorous, systematic search strategies and papers were independently reviewed. However, grey literature was excluded and only English language articles were reviewed. Due to time constraints the initial list of articles was briefly reviewed, exclusions were made by only one researcher, and study authors were not contacted for more information.

Conclusions

Despite these limitations, our findings clearly suggest that further research is needed in the field of PA interventions for people with intellectual disability. Further research is required to build an evidence base around appropriate and valid and reliable measures of PA for this population. For example, research is needed to better understand whether self-report of walking by individuals or proxies correlates with actual walking or steps taken. Studies may need to deliver surveys to both individuals and their carers so that we can better understand whether self-report leads to under- or over-reporting of health-related behaviours. Barriers faced by people with intellectual disability regarding their participation in PA should be investigated, as should barriers to wearing accelerometers and pedometers. Such

knowledge will allow future studies to maximise recruitment rates and improve data quality. Studies that adapt interventions to suit different cognitive and physical abilities of participants are needed, to allow individuals of all abilities to participate in and benefit from the intervention.

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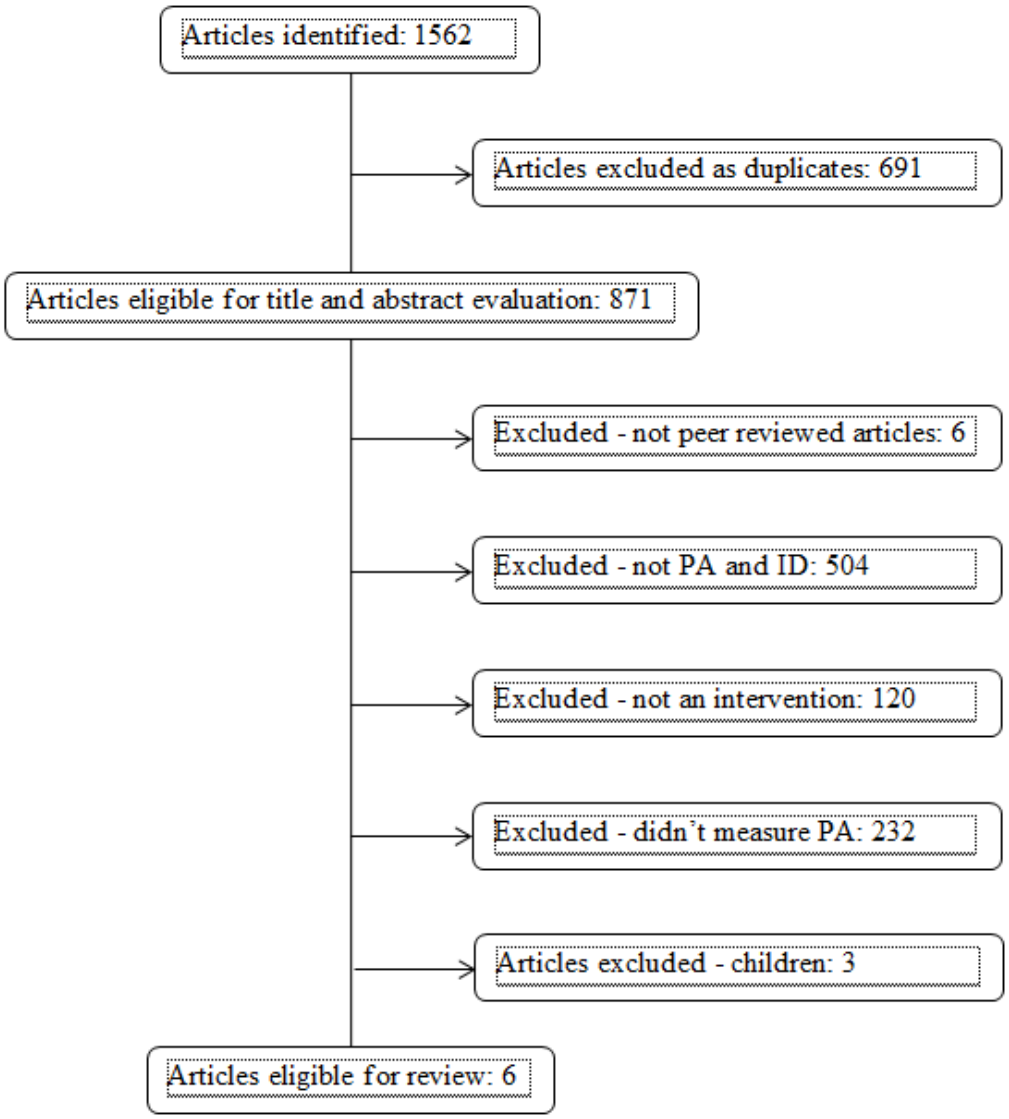

Figure 1: Flow of articles selected

Table 1. Description of reviewed studies

Author, year, country	Study design, setting, modality	Intensity frequency, duration,	Sampling strategy	Inclusion criteria	Sample characteristics
Bazzano et al., 2009 USA	Pre- post Community: within service provider Group sessions	2 hours 2 x week 7 months	Chart reviews Community presentation Flyers Referrals Mail outs with follow up phone calls	Intellectual disability Overweight or obese Risk factor for diabetes or metabolic syndrome/ diagnosis of diabetes	N=44 Age: 43% aged 40-49 61.4% female
Bodde et al., 2012 USA	Pre- post intervention with delayed treatment design Community Group sessions	30 mins 1 x week 8 weeks	Promotional flyers Word of mouth through disability service organisations Special Olympics	Mild to moderate intellectual disability Ambulatory	N=42 *Group 1*: 21 *Group 2*: 21 Mean age: 38.8 50% female
Ewing et al., 2004 USA	Pre- post with comparison group Community Group sessions Optional individual home visit	1 ½ hours + optional brisk walk 1 x week 8 weeks	Patients at family practice	*Participants with intellectual disability* Intellectual disability BMI>27 *Participants without intellectual disability:* BMI>27	*Participants with intellectual disability:* N=92 Mean age: 39.7 54.4% female *Participants without intellectual disability:* N=97 Mean age: 49.9 84.5% female

"A Systematic Review of Interventions Aiming to Improve Involvement in Physical Activity Among Adults With Intellectual Disability" by Brooker K et al.
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Author, year, country	Study design, setting, modality	Intensity frequency, duration,	Sampling strategy	Inclusion criteria	Sample characteristics
Mann et al., 2006 USA	Pre- post Community Group sessions Optional individual home visit	1 ½ hours + optional brisk walk 1 x week 8 weeks	Staff approached potential participants of local disability providers	Intellectual disability BMI>25 Excluded health condition that would restrict PA	N=192 Mean age: 38.6 66.7% female
McDermott et al., 2012 USA	RCT Community Group sessions Optional individual home visit	1 ½ hours + optional brisk walk 1 x week 8 weeks	Staff approached potential participants of local disability providers	Mild to moderate intellectual disability Ambulatory Ability to communicate verbally	*Intervention:* N=216 *Control:* N=216 Mean age: 38.8 50.3% female
Melville et al., 2011 UK	Pre- post Home Individual sessions	40-60 mins 1 x 2-3 weeks 24 weeks	Participants referred to intellectual disability dieticians	Intellectual disability Obese requesting weight loss support Excluded Prader-Willi	N=54 Mean age: 48.3 59.3% female

Table 2. Description of physical activity interventions, measures and results

Author, year, country	PA intervention	PA measure	PA results
Bazzano et al., 2009 USA	Group education on PA, nutrition, weight loss and behaviour modification Group exercise sessions	Self-reported PA interviewer administrated: frequency and duration per week	Mean frequency/week pre: 3.2 times post: 3.9 times (p=0.01) Mean minutes/week of self-reported PA pre: 133 mins post: 206.4 mins (p=0.002)
Bodde et al., 2012 USA	Group education utilising video, pictorial instructions, worksheets, role play and interactive activities aids on PA, PA benefits, PA recommendations, ways to achieve PA individually and with others, nutrition and safety	7 day accelerometers (Actigraph dual-axis)	Mean time spent in moderate to vigorous PA(mins/day) pre: 7.00 post: 7.71 (p=0.41)
Ewing et al., 2004 USA	Group education on exercise, nutrition, stress reduction, weight loss, communication, motivation to change and relapse prevention Group optional brisk walk after session Individual optional home visit to develop walking plan, dietary plan and visit to grocery store	Questions taken from BRFSS, self-report interviewer administrated: type of PA, duration, intensity, distance covered Proxy respondent when required	Exercise yes/no (%) *Participants with intellectual disability*: pre: 75 post: 70 (p=0.33) *Participants without intellectual disability*: pre: 58.8 post: 74 (p=0.013)
Mann et al., 2006 USA	Group education on exercise, nutrition, stress reduction, weight loss, communication, motivation to change and relapse prevention Group optional brisk walk after session Individual optional home visit to develop walking plan, dietary plan and visit to grocery store	Questions taken from BRFSS, self-report interviewer administrated: type of PA, duration, intensity, distance covered	Mean frequency/week pre: 3.24 times post: 4.62 times (p≤0.001)

Author, year, country	PA intervention	PA measure	PA results
McDermott et al., 2012 USA	*Intervention*: Group education on exercise, nutrition, stress reduction, weight loss, communication, motivation to change and relapse prevention Group optional brisk walk after session Individual optional home visit to develop walking plan, dietary plan and visit to grocery store *Control*: Group hygiene and safety classes (same time and venue as PA class)	7 day accelerometer (Actigraph)	*Intervention*: 52.46% increased PA at 12 months *Control*: 50.88% increased PA at 12 months (p=0.864)
Melville et al., 2011 UK	Individual dietary modification, discussion of current PA levels, ways to increase PA, goal setting in regard to PA, self-monitoring of walking levels and provided information on local PA clubs	7 day accelerometer (Actigraph GT1M)	*Accelerometer*: % mean time spent in light intensity (min/day) pre: 10.4 post: 12.3 (p=0.027) % mean time spent in moderate to vigorous intensity (min/day) pre: 2.1 post: 2.7 (p=0.072) % mean time spent in sedentary behaviour (min) pre: 87.5; post: 84.9 (p=0.012) *IPAQ-S*: no change

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Table 3. Ranking system to assess article quality

Source	Study design[1]	Focus on PA[2]	PA goals[3]	PA assessment method[4]	Disability adaption[5]
Bazzano et al.	1	2	1	1	3
Bodde et al.	1	2	1	3	3
Ewing et al.	1	2	1	1	2
Mann et al.	1	2	1	1	3
McDermott et al.	3	2	1	3	3
Melville et al.	1	2	3	3	3

[1]Study design; 1 uncontrolled trials, 2 nonrandomized trials, 3 randomised controlled trials

[2]Focus on PA; 1 not primary focus, 2 part of primary focus, 3 sole primary focus

[3]Inclusion of PA goals; 1 none, 2 implied, 3 explicit

[4]PA assessment; 1 subjective only, 2 secondary measures objective, 3 primary measures objective

[5]Disability adaption; 1 none, 2 recruitment of people with intellectual disability, 3 intervention adapted for people with intellectual disability